

REMARKS

This is a full and timely response to the outstanding non-final Office Action mailed November 2, 2005 (Paper No. 103005). Upon entry of this response, claims 46-50 are pending in the application. In this response, claim 46 and 50 have been amended. Applicants respectfully requests that the amendments being filed herewith be entered and request that there be reconsideration of all pending claims.

1. Rejection of Claims 48 and 49 under 35 U.S.C. §112, Second Paragraph

Claims 48 and 49 have been rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as their invention. The Office Action states that:

Specifically, the language within lines 4 and 5 of claim 48 is unclear with respect to what is being reacted. The language “reacting a compound obtained by reacting a compound (eb) with a compound (fb) and further reacting with a compound (i)”, is confusing, because it cannot be determined what is being initially reacted with the “obtained” compound, since compound (i) is claimed as being “further” reacted. In other words, there appears to be too many occurrences of “reacting.”
(Office Action, p. 2)

Independent claim 48 is amended to further clarify the subject matter which Applicants regard as their invention. Applicants respectfully submit that the amendment overcomes the rejection of claims 48 and 49, and requests that the rejection be withdrawn.

2. Rejection of Claims 46 and 47 under 35 U.S.C. §103

Claims 46 and 47 have been rejected under §103(a) as allegedly obvious over *Barron* (U.S.4,067,844) or *Zwiener* (U.S. 5,364,955). Applicant respectfully traverses the rejection of claims 46 and 47. It is well established at law that, for a proper rejection of a claim under 35 U.S.C. §103 as being obvious based upon a combination of references, the cited combination of

references must disclose, teach, or suggest, either implicitly, all elements/features/steps of the claim at issue. *See, e.g., In re Dow Chemical*, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988); *In re Keller*, 208 U.S.P.Q.2d 871, 881 (C.C.P.A. 1981).

a. Claim 46

The Office Action takes the position that “the respective processes [of *Barron* and *Zwiener*] yield the same product and the only difference amounts to changing the sequence of steps in a multi-step process, and it has been held that such a modification is obvious where an unexpected result is not obtained.” (Office Action, p. 3, section 4.) As will be explained in more detail below, Applicants respectfully disagree with this characterization of the references as yielding the same product as claims 46 and 47.

1) *Barron* and *Zwiener* Produce a Side Reaction

As argued in the last Office Action, both *Barron* and *Zwiener* disclose that a prepolymer is produced in step (2) of their respective processes. Applicants also argued that because a prepolymer is produced a side reaction such as dimerization and trimerization of urethane prepolymer inevitably occurs, so that a product produced by *Barron* or *Zwiener* has high molecule and high viscosity. (See Response filed Aug. 3, 2005, p. 8). In contrast, the process of claim 46 dispenses with the step of producing a prepolymer, and a product of claim 46 has low viscosity. Thus, the process of claim 46 differs in a non-obvious way from the processes disclosed in *Barron* and *Zwiener*.

The outstanding Office Action stated that Applicants’ arguments about side reactions were unsubstantiated opinion, since no evidence or logical rationale was provided to support Applicants’ position. (Office Action, p. 4.) Applicants provide herein both logical rationale and experimental data supporting Applicants’ position with regard to side reactions.

In a reaction process like *Barron* and *Zweiner*, when a polyisocyanate is reacted with a polyol, a prepolymer is produced. If this reaction progresses ideally, the NCO terminated prepolymer (basic unit) is obtained with reaction of two polyisocyanate molecules and one polyol molecule. However, as shown by experimental data in Table 3-18 of Appendices A and B, a dimer (double unit) and trimer (triple unit) which has twice or three times of molecular weight are also produced by side reactions, due to both polyisocyanate and polyol being multi-functional compounds. Accordingly, the final prepolymer product contains a large amount of high weight molecules. (Appendix A is a Japanese language article from a 1996 issue of “Adhesion Technology Japan”, and Appendix B is the English translation of Table 3-18.)

Dimerization and trimerization in prepolymer production are clearly seen in the data of Appendix A/B, which will now be explained in detail. Table 3.18 shows the GPC (Gel Permeation Chromatography) charts of the prepolymer, with various isocyanate group contents which have been obtained using the same polyol (molecular weight 3000 of PPG) and polyisocyanate (polymeric MDI). In the Table, “iso monomer” means isocyanate monomer, “iso dimer” means dimer of isocyanate, “iso trimer” means trimer of isocyanate, “iso tetramer” means tetramer of isocyanate, “basic unit” means monomer or basic unit (prepolymer), “pre dimer” means dimer (double unit) of prepolymer, and “pre trimer” means trimer (triple unit) of prepolymer.

In the Table, chart (a) shows the prepolymer (15% isocyanate group content) which is obtained by 2:1 reaction with NCO group of polyisocyanate and OH group of polyol. Even in such prepolymer prepared at the theoretical reacting ratio, peak (7) of “pre dimer (double unit)” is observed. Further, as the isocyanate group content in the prepolymer is decreased from 15% to 6% the content of “pre dimer (double unit)” (7) and “pre trimer (triple unit)” (8) is increased. In

any case where isocyanate group content is 15%, 9% or 6%, the dimer and/or trimer exist in the prepolymer product.

In other words, the side reaction, that is, production of dimerization and trimerization, *inevitably* occurs in producing a prepolymer by reacting a polyisocyanate with a polyol. Accordingly, an actual pre-polymer composition has higher molecule weight and higher viscosity than those of the ideal basic unit. Also, the final product or resin compositions, which use the prepared prepolymer as raw materials, have high viscosity. As is apparent from the above, the occurrence of side reactions is already known, and is supported by Appendix A/B.

The process of claim 46 therefore differs in a non-obvious way from the processes disclosed in *Barron* and *Zwiener*. Accordingly, a *prima facie* case establishing an obviousness rejection under *Ex parte Rubin* has not been made. For at least these reasons, claim 46 is not obvious over *Barron* or *Zwiener*, and the rejection should be withdrawn.

2) *Barron* and *Zwiener* Produce a Different Product than Claim 46

As argued in the last Office Action, according to the process disclosed in *Barron* and *Zwiener*, the urethane polymer has a hydrolysable silyl group and a NCO group in the terminal. On the other hand, the product of claim 46 has a hydrolysable silyl group and an OH group in the terminal. (See Response filed Aug. 3, 2005, pp. 8-9.) Thus, the products of *Barron* and *Zwiener* are different from the product of claim 46.

The outstanding Office Action stated that “applicants’ arguments are largely based upon the position that the instant products have an OH group in the terminal; however, applicants’ claims are not so limited. There is no requirement that such a terminal OH group exists or be produced.” (Office Action, p. 4.) Applicants provide herein a logical rationale supporting Applicants’ position.

Considering the process of the reaction, it is clear to one of ordinary skill in the art that the product by the process of claim 46 necessarily contains hydrolysable silyl group terminated polymer, and may in some circumstances contain OH group terminated polymer. However, applicants do not limit the product of claim 46 to the products having a terminal OH group. Applicants' reference to the "OH group" in the last response was made to emphasize the difference from *Barron* and *Zwiener*. The final product of claim 46 is hydrolysable silyl group terminated polymer, and if all ends of polyol do not react, the product may have a terminal OH group. That is simply an issue of possibility or probability.

Specifically, the process of Claim 46 comprises (1) obtaining a silicon compound (product (N)) having an active hydrogen being reactive with a isocyanate group, (2) reacting the product (N) with a compound (G) having an NCO group to obtain a silicon compound (product (O)) having a NCO group, and (3) reacting the product (O) with a compound having an OH group. The final product is hydrolysable silyl group terminated polymer. and if all ends of polyol do not react, the product may have a terminal OH group. See Appendix C.

In contrast, reactions in the references are different from the present invention. The process of *Barron* comprises the steps of (1) obtaining an aminosilane, (2) reacting a polyol compound with a polyisocyanate compound to produce a urethane prepolymer, and (3) reacting the aminosilane with the urethane prepolymer. (Col. 2, lines 59-66 and Col. lines 37-50.) The final product contains components of higher molecule weights and has hydrolysable silyl group, but it cannot possibly have a terminal OH group. See Appendix E.

Further, the process of *Zwiener* comprises the steps of (1) reacting a polyol compound with a polyisocyanate compound to produce a urethane prepolymer, (2) obtaining an aminosilane, and (3) reacting the amino silane with the urethane prepolymer (Examples 5 and 8).

The final product contains components of higher molecule weights and has hydrolysable silyl group, but cannot possibly have a terminal OH group. See Appendix F.

In summary, none of the cited references disclose, teach, or suggest the product of claim 46.

b. Claim 47

Since independent claim 46 is allowable, Applicants respectfully submit that claim 47 is allowable for at least the reason that it depends from an allowable claim. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q. 2d 1596, 1598 (Fed. Cir. 1988). Therefore, Applicants respectfully request that the rejection of claim 47 be withdrawn.

3. Rejection of Claim 50 under 35 U.S.C. §103

Claim 50 has been rejected under §103(a) as allegedly obvious over *Krafcik* (U.S. 5,614,604). Applicants respectfully submit that the claim amendments made herein overcome the objection. It is well established at law that, for a proper rejection of a claim under 35 U.S.C. §103 as being obvious based upon a combination of references, the cited combination of references must disclose, teach, or suggest, either implicitly, all elements/features/steps of the claim at issue. *See, e.g., In re Dow Chemical*, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988); *In re Keller*, 208 U.S.P.Q.2d 871, 881 (C.C.P.A. 1981).

1) *Krafcik* Produces a Product without a Terminal OH Group

As argued in the last Office Action, according to the process disclosed in *Krafcik*, the terminal of the polymer of *Krafcik* is hydrolysable silyl group, or an alkyl group connected with a urethane linkage, and the hydrolyzed silyl group is hydrolyzed with water. In contrast, the terminal of the product of claim 50 is a hydrolysable silyl group and an OH group. (See

Response filed Aug. 3, 2005, pp. 8-9). Thus, the product of *Krafcik* is different from the product of claim 50.

The outstanding Office Action stated that “applicants’ arguments are largely based upon the position that the instant products have an OH group in the terminal; however, applicants’ claims are not so limited. There is no requirement that such a terminal OH group exists or be produced.” (Office Action, p. 4.) Applicants provide herein a logical rationale supporting Applicants’ position.

Considering the process of the reaction, it is clear to one of ordinary skill in the art that the product by the process of claim 50 necessarily contains hydrolysable silyl group terminated polymer, and may in some circumstances contain OH group terminated polymer. However, Applicants do not limit the product of claim 50 to the products having a terminal OH group. Applicants’ reference to the “OH group” in the last response was made to emphasize the difference from *Krafcik*. The final product of claim 50 is hydrolysable silyl group terminated polymer, and if all ends of polyol do not react, the product may have a terminal OH group. This is simply an issue of possibility or probability.

In contrast, reactions in the references are different from the present invention. The process of *Krafcik* comprises the steps of (1) producing a urethane prepolymer, (2) reacting an NCO group of the urethane prepolymer with an alcohol and an aminosilane, and (3) charging water (Col. 5, line 31 to Col. 6, line 9). The final product has no terminal OH group. The final product contains components of higher molecule weights and has hydrolysable silyl group, but it cannot possibly have a terminal OH group. See Appendix G. In summary, *Krafcik* does not disclose, teach, or suggest the product of claim 50.

2) Amended Claim 50 Produces a Moisture Curable Product

Applicants argued in the last response that the product of claim 50 differs from the product of *Krafcik* in that *Krafcik* is directed to a polyurethane dispersion, while the product of claim 50 is directed to a moisture curable product. The outstanding Office Action indicated that Applicants' argument "does not distinguish the claim from the prior art. Nothing in applicants' claim requires the product to be moisture curable...The claim is open to virtually any step or modification." (Office Action, p. 5, section 8.)

Claim 50 has been amended to recite "A process for the preparation of *moisture curable* urethane resins..." Therefore, even if Applicants' claimed process was analogous to changing a sequence of steps, Applicants' claimed process produces unexpected results. Therefore, a *prima facie* case establishing an obviousness rejection under *Ex parte Rubin* has not been made. For at least these reasons, claim 50 is not obvious over *Krafcik*, and the rejection should be withdrawn.